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THE CONDITION OF THE SPRUCE-FIR CUTOVER AREAS OF  
THE ROCKY MOUNTAIN REGION U. S. FOREST SERVICE 1964

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A REPORT ON  
THE CONDITION OF  
THE SPRUCE-FIR CUTOVER AREAS  
OF  
THE ROCKY MOUNTAIN REGION  
U. S. FOREST SERVICE

1964

C. C. AVERILL

(As condensed and revised by M. D. Andrews)

INTRODUCTION

Engelmann spruce (Picea engelmannii Parry)-subalpine fir (Abies lasiocarpa (Hook) Nutt.) and corkbark fir (Abies lasiocarpa var. arizonica (Merriam) Lemm.) cutover areas on 13 National Forests in Colorado and eastern Wyoming were examined during the summer and early fall of 1964. 1027 cutover stands totaling approximately 120,000 acres were included in the survey.

The overall purpose of this survey was to determine the general condition of the cutover spruce-fir types. To accomplish this objective, it was necessary to:

- a. Determine the location in the field of each spruce-fir cutover area.
- b. Visit and examine each of the cutover stands and determine the condition as to quality, quantity and distribution of the growing stock.
- c. Update Ranger District compartment records.

THE SPRUCE INVENTORY

A 100 percent aerial photograph delineation of the spruce-fir type of the National Forests of the Rocky Mountain Region made during the period of 1956-1961 shows the area by size classes as follows:

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EXPERIMENT STATION

## THE SPRUCE INVENTORY (Con't)

### Area in Acres

#### States

<u>Stand Size Classes</u>	<u>Colorado</u>	<u>Wyoming</u>	<u>Total</u>	<u>Percent</u>
Sawtimber	2,163,000	318,000	2,481,000	73
Poletimber	419,000	77,000	496,000	15
Sapling-seedling	29,000	7,000	36,000	01
Nonstocked	124,000	12,000	136,000	04
Unclassified	260,000	- -	260,000	07
(insect killed)				
Total	2,995,000	414,000	3,409,000	100

The inventory estimated 24.0 billion board feet, net, of Engelmann spruce and 4.5 billion board feet, net, of subalpine and corkbark fir in the sawtimber type.

Fifty-one percent of the total area and 43 percent of the sawtimber volume of the spruce-fir type in U. S. Forest Service Regions 1, 2, 3 and 4 is in Region 2.

About 65 percent of the Engelmann spruce sawtimber volume is in trees past rotation age. An additional 20 percent of the volume is in trees that will reach rotation age prior to the year 2000.

### UTILIZATION

Spruce cutting in the Region dates back to the later part of the 19th century. There was only limited demand for the species until the beginning of the past decade when Regions 1 and 2 put more than one-half billion board feet of spruce lumber on the market in connection with the bark beetle control programs of 1954-57. During the past ten years, demands for spruce have held up better than for other species of the Region.

### SURVEY METHOD

Each Forest conducted the field examination of the cutover areas using professional Foresters of grade GS-7 and higher.

Since this survey deals with the quality and quantity of residual growing stock, definitions for growing stock and stocking are redefined in the following.

### GROWING STOCK DEFINITION

Growing stock trees as defined in the cutover survey are those that would be favored in management or cultural operation throughout the rotation period.

To qualify in the cutover survey as growing stock, the trees must be of a commercial species of seedling-sapling size, i.e., less than 5.0" dbh. The age should be less than 40 years for Engelmann spruce. The crown must be healthy and equal to at least 40% of the tree height. The tree must be free of any external defects and disease that would affect future growth and the quality of the wood. The general age class of subalpine and cork-bark fir advance reproduction should not exceed 60-70 percent of that of the spruce reproduction, since the pathological rotation of the fir is considerably less than that for Engelmann spruce.

Stocking of seedlings 3 years of age and older and sapling size trees less than 5.0" dbh were combined and computed by both percent and average number of trees per acre, using 1/300 acre fixed radius plots.

Not over two growing stock trees were counted per plot. A 100 percent stocking would represent 600 seedling-saplings of growing stock quality per acre. Quality seedling-saplings of more than two per plot were listed as excess.

The stocking of trees 5.0" dbh and larger was recorded by 2" dbh class. A variable plot system was used in which trees falling within the limiting distance of a 40 basal area factor angle gauge were recorded. The average square feet of basal area per acre was computed by three classes: cull trees 5.0" dbh and larger; merchantable trees 5.0"-8.9" dbh; merchantable trees 9.0" dbh and larger.

### MINIMUM ACCEPTABLE STOCKING LEVEL

For the purpose of this survey, stands that had an average of less than 240 seedling-saplings of growing stock quality of which less than one-half were Engelmann spruce were considered unsatisfactorily stocked. Thus, all stands below 40% stocking were considered unsatisfactory.

### SEED SOURCE

All of the cutover areas with the exception of scattered small islands had a seed source. Eighty-two percent of the total cutover area had an internal seed source in trees unmerchantable due to size and cull, and in some cases from merchantable size trees that were not cut. The above figures can be applied in a general way to the spruce situation Region-wide, but cannot be verified for a particular Forest or working circle.

## RESULTS

Natural regeneration was common throughout the spruce-fir type, both cut-over and uncut. Of the 119,330 acres examined, about 37% was classed as nonstocked or understocked.

About 75 percent of the poorly stocked area was cut during the past 10 years, 1955-1964, and 38 percent was cut during the past 5 years, 1960-1964. This could lead to the conclusion that time will solve the problem. This is not necessarily so because the major part of the older cut area was horse-logged while the greater part of the recent cutting was tractor-logged. This situation has been further complicated by more intensive slash treatment. Insect problems focused attention on the treatment of slash. Field observations made this summer (1966) show that while stocking is satisfactory in most instances where no slash treatment was done, there are some areas having scattered seed trees, on which no slash work was done, that have not restocked after 14 years.

The Averill survey report includes a number of tables which purport to show certain relationships between presence or absence of stocking, and overstory after logging, effects of slash treatment, and other variables, but I do not feel they should be included here. The survey was not designed for this purpose and therefore did not provide a satisfactory basis for the conclusions which might be drawn from the tabulations.

The survey cannot be regarded as applicable to Forests or Ranger Districts. However, it may very well reflect the general overall condition of the total cutover area in Region 2. I suggest that the following table be accepted as representing the general condition of Engelmann spruce cutover areas in the Region as a whole.

This tabulation is based on 40% of 600 trees per acre which is 240 trees.

	<u>Acres 40% or more stocked with growing stock, plurality in Engelmann spruce</u>	<u>Acres 40% or more stocked, plurality in true firs</u>	<u>Acres less than 40% stocked</u>	<u>Total</u>
Areas without a residual overstory	7,250	2,210	12,200	21,660
Areas with a live residual overstory	43,070	21,900	32,700	97,670
Total	50,320	24,110	44,900	119,330

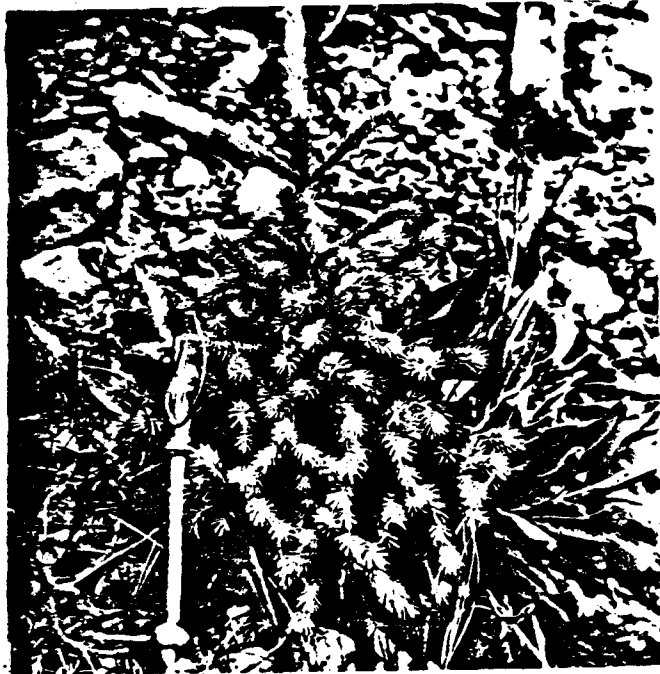
### PROBLEM AREAS

The natural regeneration on the cutover areas of the Shoshone, Gunnison and San Juan Forests appears to be considerably less than that on other Forests. Geographically, this is in the northwest and southwest portions of the Region; the better stocking was found in the central portion. Field observations show considerable correlation between uncontrolled animal use of cutover areas and inadequate regeneration after logging.

### CONCLUSION

The regeneration of spruce-fir cutover areas in the Rocky Mountain Region need not be an impasse. At least a moderate amount of reproduction was found on 63% of the cutover areas. Certainly it can be assumed that good presale planning, the application of current knowledge pertaining to the species, effective sales supervision, and protection from animal damage should result in more than adequate stocking on all except the dryer sites. In the meantime, as shown in the report, and reaffirmed here, the Region has about 45M acres of reforestation to do in the understocked areas and 24M acres of release and weeding to do in the areas predominately stocked with true firs.

ADVANCED REGENERATION  
CLASSED AS GROWING STOCK



Engelmann spruce. Arapaho N.F.



Subalpine fir. Arapaho N.F.



Residuals of subsawlog size can be considered as a seed source.

In some areas, scattered residuals of sawlog size or approaching sawlog size have not produced any spruce regeneration after 14 years since cutting.





Engelmann spruce subsequent reproduction  
in skid road. Pike N.F.



Mixed advance and subsequent regeneration  
in a spruce-lodgepole pine cutover stand.  
Lodgepole pine reproduction is of questionable  
value as growing stock, due to heavy dwarf-  
mistletoe infection in residual lodgepole  
pine overstory. Roosevelt N.F.



Advanced subalpine fir reproduction of questionable value as growing stock. Research is needed on the value of this kind of regeneration.

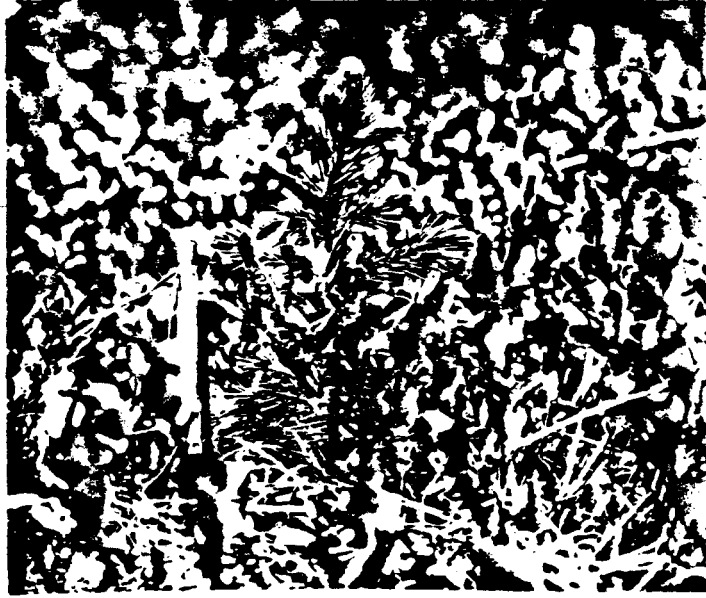
San Juan N.F.



Openings such as this are common. Vegetation is an inhibiting factor in the regeneration of this stand.

Routt N.F.

DESIRABLE GROWING STOCK  
SUBSEQUENT REPRODUCTION



Engelmann spruce seedling in Vaccinium.  
White River N.F.



Engelmann spruce seedling on bare soil.  
Rio Grande N.F.

ADVANCED REGENERATION OCCURRED IN GROUPS  
SOME OF WHICH WOULD BE CLASSED AS GROWING STOCK



Engelmann spruce of this size was classed  
as growing stock. San Juan N.F.



Subalpine firs of this size and age are  
of questionable value as growing stock  
for a sawtimber rotation. Rio Grande N.F.